

Alcorn  
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REQUEST FOR CHANGES AND ADDITIONS TO PROPOSED CODE CHANGE  
PROPOSAL FOR UPDATES TO TITLE 24 TREATMENT OF SKYLIGHTS

I am Jerome Blomberg, representing Sunoptics Prismatic Skylights, 6350 27th street, Sacramento, Ca 95822, (916) 395-4700. I would like to suggest the following changes and additions to the PG&E proposal on skylights.

Mandatory Automatic Lighting Controls in the Daylit Zones Under Skylights  
Page 41

"2" When the daylit area in any enclosed space is under skylights and has a total area greater than 2,500 square feet, should be changed to 800 square feet.

If automatic multi-level daylighting controls are cost effective in 2500 square feet using a cost of \$2,000, then using a more realistic cost of \$675 for an enclosed area of 800 square feet would be cost effective.

If the control hardware required was produced in quantity, the cost could be reduced by 50% to 60%. Requiring automatic controls in this reduced size will give manufacturers the hope of increased production runs. They might even design new equipment that is cheaper to build and more user friendly. One of the reason the cost figures used, came in so high is that the people giving the information were including a lot of electrical equipment that would be required for the lighting system without automatic controls. Also the installation of automatic lighting controls is rare and the contractor puts in a CYA factor to cover mistakes and for learning time. Mandating multi-level controls in smaller spaces will bring down the cost of dimmable ballasts. The CEC should take a leadership roll here like they did with electronic ballasts.

Prescriptive Requirements for Skylights in Large Low-Rise Nonresidential Buildings Page 42  
(take out Large)

Reduce the exemption for buildings with less than 0.5 watts of electric lighting to less than 0.1 watts per square of electric lighting. Retrofitting the building with skylights is more costly than putting the skylights in during construction. Roof warranties may be voided in a retrofit installation. If daylighting is installed at the time of construction, the extra cost is approximately \$0.60 per sq. ft. of floor area.

The CEC would surely be responsive to conservation measures that reduced human comfort or productivity. I believe that the Commission should also

recognize Energy Conservation Measures that enhance human satisfaction and sense of well being and increase human productivity. If we are serious about building a sustainable energy future, daylighting buildings has got to be one of the building blocks. If daylighting is installed in all appropriate low rise nonresidential buildings in California , California will have cleaner air, waste less water, send less money out of state and have the collateral benefit of improved employee morale, reduced absenteeism, reduced errors, improved product quality, and increased productivity.

“A” should be changed from 25,000 square feet to 5,000 square feet.

It doesn't make any sense at all to exempt buildings smaller than 25,000 square feet, than it would be to exempt small cars, small houses or small water heaters from any energy efficiency standards. The skylights are just as cost effective in small buildings as they are in large buildings.

“C” the exemption for ceiling height should be reduced from 15 feet to 12 feet.

Using the proposed changes for skylight spacing and daylit area, a 4 foot by 4 foot skylight would illuminate a 433 square foot area, with an SFR of 3.7%. The use of 4040 skylights to daylight is cost effective. The only justification for exempting buildings with less than 15 foot ceilings would be that smaller skylights would increase cost to such a degree that daylighting would not be cost effective, and that is not the case here.

There are two other items that would be useful in the standard that would make it easier for every one, manufacturers, designers and building inspectors.

1. Create default u values for single and double glazed lenses that seal off the skylight well at the roof insulation line. The use of this lower lens should be accepted for a double glazed skylight in conditioned space.
2. Exempt 8% of the roof from u value considerations when the skylights are installed with automatic motorized light control louvers as well as automatic multi-level electric lighting controls

Thank you for receiving these comments. I have been an advocate for good daylighted buildings as a rational energy policy, for California, for 28 years. I am pleased that there is a good probability that this advocacy will bear fruit in the 2005 update. We are all getting older and some of us may not be around for the 2010 version, so lets get it as right as we can this time.

**TWO STEP SWITCHING CONTROLS**

PHOTO-DIODE PHOTO-CELL WITH	
INSTALLATION BRACKET	\$ 150.00
100' 3 PAIR 18 GA. PLENUM WIRE	\$ 50.00
TWO STEP CONTROL-BOARD PLUS OFF	\$ 200.00
TWO CIRCUIT RELAY WITH TRANSFORMER	\$ 75.00
TOTAL MATERIAL COST	\$ 475.00
LABOR TO INSTALL AND CALIBRATE	\$ 200.00
<b>TOTAL COST</b>	<b>\$ 675.00</b>

5,000 SQ. FT MINIMUM SIZE BUILDING TO MANDATE DAYLIGHTING  
800 SQ. FT. MINIMUM ENCLOSED AREA TO REQUIRE AUTOMATIC  
ELECTRIC LIGHTING CONTROLS.

**COST OF CONTROLS PER SQ. FT OF 800 SQ. FT. AREA =**

**\$675/800=\$.84**

**COST OF CONTROLS PER SQ. FT OF 5,000 SQ. FT. AREA =**

**\$675/5,000=\$.14**

**COST OF CONTROLS PER SQ. FT OF 50,000 SQ. FT. AREA =**

**\$675/50,000=\$.03**

RELAY CAN CONTROL TWO 15 AMP CIRCUITS IN SMALL AREAS  
LIKE CLASS ROOMS, FOR A TOTAL OF 8000 WATTS OF 277  
VOLT LIGHTING. AT 1.5 WATTS PER SQ. FT., THIS SYSTEM CAN  
CONTROL THE LIGHTING FOR 5000 SQ. FT. FLOOR AREA.

SWITCHING SIGNALS FROM RELAYS GO TO CONTACTORS  
FOR LARGE AREAS. CONTACTORS SHOULD NOT BE INCLUDED  
IN THE CONTROL COST AS THEY ARE REQUIRED WITHOUT  
THE AUTOMATIC CONTROLS.

THE COST OF PHOTO-CONTROLS FOR A 960 SQ. FT. CLASSROOM  
IS ABOUT \$ .70 PER SQ. FT..FOUR 4040 DOUBLE GLAZED  
SKYLIGHTS COST \$1200 INSTALLED PLUS \$675 FOR A TOTAL  
OF ABOUT \$2.00 PER SQ. FT. ADDING PHOTO-CONTROLLED  
DAYLIGHT LOUVERS WOULD ADD \$2000 FOR A TOTAL OF UNDER  
\$4.00 PER SQ. FT

IF STUDENTS LEARN 15% FASTER IN GOOD DAYLIGHTED SPACE  
( SEE HESCHONG MAHONE STUDY)AND THERE ARE 20 STUDENTS  
PER CLASSROOM AND THE SCHOOL DISTRICT SPENDS \$6000  
PER STUDENT PER YEAR AND THE PURPOSE OF THE SCHOOL IS TO  
TEACH, THEN THE PAYBACK IS \$4,000.00/(20X\$6000X15%)  
OR 3 MONTHS. THE PAYBACK FROM THE ENERGY SAVED WILL  
TAKE LONGER, BUT WILL BE LESS THAN 15 YEARS.

<b>SINGLE GLAZED SKYLIGHT COST</b>				<b>SKYLIGHT PERFORMANCE AVAILABLE TO ANY SKYLIGHT MANUFACTURER</b>	
	<b>4040</b>	<b>4080</b>	<b>5060</b>		
	<b>16 SQ. FT.</b>	<b>32 SQ. FT.</b>	<b>30 SQ. FT.</b>		
SKYLIGHT ONLY \$	87.00	\$ 135.00	\$ 128.00	70% VLT 100% HAZE	
PREFABRICATED CURB \$	75.00	\$ 100.00	\$ 95.00	VLT USED IN STUDY	
SAFETY SECURITY GUARD \$	11.00	\$ 20.00	\$ 20.00	42% VOLT 100% HAZE	
INSTALL CURB \$	30.00	\$ 30.00	\$ 30.00	28% DIFFERENCE	
EXTRA ROOFING LABOR \$	40.00	\$ 40.00	\$ 40.00	<b>67% HIGHER TRANSMITTANCE</b>	
INSTALL SKYLIGHT \$	25.00	\$ 30.00	\$ 30.00	THAN THE SKYLIGHT USED	
<b>TOTAL COST TO CONTRACTOR \$</b>	<b>268.00</b>	<b>\$ 355.00</b>	<b>\$ 343.00</b>	TO SHOW COST EFFECTIVENESS	
COST USED IN PAY BACK STUDY \$		610.00		THIS REDUCES PAY BACK PERIOD	
DIFFERENCE \$		255.00			
				<b>42% LESS COST THAN THE PRICES USED TO SHOW COST EFFECTIVENESS</b>	
<b>DOUBLE GLAZED SKYLIGHT COST</b>				<b>SKYLIGHT PERFORMANCE AVAILABLE TO ANY SKYLIGHT MANUFACTURER</b>	
	<b>4040</b>	<b>4080</b>	<b>5060</b>		
	<b>16 SQ. FT.</b>	<b>32 SQ. FT.</b>	<b>30 SQ. FT.</b>		
SKYLIGHT ONLY \$	116.00	\$ 190.00	\$ 177.00	68% VLT 100% HAZE	
PREFABRICATED CURB \$	75.00	\$ 100.00	\$ 95.00	VLT USED IN STUDY	
SAFETY SECURITY GUARD \$	11.00	\$ 20.00	\$ 20.00	0.39 100% HAZE	
INSTALL CURB \$	30.00	\$ 30.00	\$ 30.00	0.29 DIFFERENCE	
EXTRA ROOFING LABOR \$	40.00	\$ 40.00	\$ 40.00	<b>74% HIGHER TRANSMITTANCE</b>	
INSTALL SKYLIGHT \$	25.00	\$ 30.00	\$ 30.00	THAN THE SKYLIGHT USED	
<b>TOTAL COST TO CONTRACTOR \$</b>	<b>297.00</b>	<b>\$ 410.00</b>	<b>\$ 392.00</b>	TO SHOW COST EFFECTIVENESS.	
COST USED IN PAY BACK STUDY \$		770.00	-	THIS REDUCES PAY BACK PERIOD	
DIFFERENCE \$		360.00			
<b>ACTUAL INSTALLED COST OF A WAL*MART 5060 SKYLIGHT DOUBLE GLAZED \$</b>	<b>327.00</b>				
				<b>47% LESS COST THAN THE PRICES USED TO SHOW COST EFFECTIVENESS</b>	

AT 4% SFR EACH SQ. FT. OF SKYLIGHT AREA WILL LIGHT 25 SQ. FT. OF FLOOR AREA.

		SKYLIGHT SIZE	4040	4080	5060
		SKYLIGHT AREA	16 SQ. FT.	32 SQ. FT.	30 SQ. FT.
		DAYLIT AREA PER SKYLIGHT	400	800	750
UNIT COST PER INSTALLED SINGLE GLAZED SKYLIGHT		\$	268.00	\$ 355.00	\$ 343.00
UNIT COST PER INSTALLED DOUBLE GLAZED SKYLIGHT		\$	297.00	\$ 410.00	\$ 392.00
COST PER SQ. FT. FLOOR AREA @ 4% SFR SINGLE GLAZED.		\$	0.67	\$ 0.44	\$ 0.46
COST PER SQ. FT. FLOOR AREA @ 4% SFR DOUBLE GLAZED		\$	0.74	\$ 0.51	\$ 0.52
COST PER SQ. FT. OF FLOOR AREA FOR SKYLIGHTS	800 SQ. FT.	\$	1.51	\$ 1.28	\$ 1.31
AND PHOTO-CONTROLLED SWITCHING OF TWO	800 SQ. FT.	\$	1.58	\$ 1.35	\$ 1.36
LEVELS OF ELECTRIC LIGHTING	5,000 SQ. FT.	\$	0.81	\$ 0.58	\$ 0.60
	5,000 SQ. FT.	\$	0.88	\$ 0.65	\$ 0.66
	50,000 SQ. FT.	\$	0.70	\$ 0.47	\$ 0.49
	50,000 SQ. FT.	\$	0.77	\$ 0.54	\$ 0.55

# SUNOPTICS PRISMATIC SKYLIGHTS

## The Natural Light Fixture

### **DAYLIGHTING BUILDINGS PROPERLY WITH SUNOPTICS CAN:**

- Replace electric lighting 70% to 80% for the daylight hours.
- Repay their cost in energy savings in just a few years.
- Give a higher return on their cost than any other guaranteed investment's dividend.
- Be installed in buildings to replace electric lighting for one twentieth the cost of enough photo-voltaic panels to generate an equivalent amount of electricity. **(both use the same sun)**
- Be one of the most cost effective measures in our national search for a sustainable energy future.
- Be an alternate energy power plant in every building, replacing electric lighting during the daylight hours for less than \$0.015 per kWh while reducing lamp and ballast replacement costs.
- Improve employee morale, reduce absenteeism, reduce errors, improve product quality, and increase productivity.
- Increase rates of student's learning in schools by up to 26%.
- Increase retail sales substantially. (one study showed sales 40% higher)
- Reduce dependence on foreign energy supplies.
- Reduce greenhouse gases, air and water pollution from the generation of electricity.

### **SPECIFY SUNOPTICS PRISMATIC SKYLIGHTS AND GET:**

- The highest visible light transmittance, consistent with optimal light distribution. Prismatic lenses makes the difference, refracting the sun's laser beam into thousands of baby sun beams. (good daylighting doesn't include hot spots or glare)
- Acrylic lenses only. Acrylic is unmatched for light transmittance when new, with practically no depreciation over time. PETG, polycarbonate and fiberglass lenses loose light transmittance and yellow much faster than acrylic, compromising the daylighting performance.

- More lens shapes; flat for sloped roofs (4 / 12 or higher), low rise pyramid and double hip shapes, that blend with the roof lines, multi-lights for large openings and the Industrial, Sunrise Arch. This unique shape lens was introduced by Sunoptics, in 1980. Photometric tests conducted by Lighting Research Laboratory, indicates 20% more light enters the building in early morning and late afternoon, compared to bubbles.
- Insulated thermal break frames to minimize condensation and heat loss.
- Electrically or manually operated light control louvers.
- A complete photo-controlled daylighting system. Sunoptics' LCM 1000 controls electrically operated light control louvers, to maintain the desired daylight levels, as well as switch one, two, or three levels of electric lighting when there is insufficient daylight. Light levels are fully controllable with the turn of a knob and the push of a timed override button. The user has full control with no loss of energy savings. The system is designed and priced to be cost effective in small areas like classrooms.
- Free daylighting design assistance from people that have daylighted over 50 schools, more than 750 WAL\*MART STORES (in every climate in the United States) and hundreds of other stores, factories, warehouses and residences.
- More and better daylighting for your construction dollar.

Twenty five years ago, Sunoptics Prismatic Skylights was started with a mission of replacing enough electric lighting with daylight, at peak demand, to equal the generating capacity of a 1,000 mega-watt power plant. With WAL\*MART's and many other's help, Sunoptics is nearing 200 mega-watts of replaced peak power.

**WE NEED YOUR HELP. YOU NEED OUR HELP.** LET'S WORK TOGETHER TO REDUCE GREENHOUSE GASES AND OTHER AIR AND WATER POLLUTANTS. LET'S PROVIDE BRIGHTER PLACES TO LIVE, WORK, LEARN, AND PLAY. TOGETHER WE CAN DO OUR PART IN BUILDING A SUSTAINABLE ENERGY FUTURE AND AN ENERGY INDEPENDENT AMERICA.

DAYLIGHTING WITH SUNOPTICS  
is  
CONSERVATION WITHOUT SACRIFICE

TO VIEW A SLIDE SHOW OF OUR DAYLIGHTED PROJECTS  
GO TO [www.sunoptics.com](http://www.sunoptics.com)

## LCM 1000 LIGHT AND LOUVER CONTROLLER

To optimize energy savings, increase lamp and ballast life, and reduce air conditioning loads, automatic controls are required. **The LCM 1000 uses digital technology to optimize all the functions required to save electric energy year round and to always reduce peak electric demand. The teacher will not loose any control. On an annualized basis, daylight from skylights can replace electric lighting approximately 2/3rds of the daylight hours.**

Each classroom must be calibrated to the design light level. With the indicator on the knob at Set, the room is calibrated to the room variables including the ratio of skylight to room area, and the reflectance of the room surfaces and furnishings.

Daylight levels and electric light switch points can be reduced by turning the knob counter clockwise (to the left). As the daylight levels are reduced, the switch points for the electric lights are reduced proportionately. Turning the knob counter clockwise to the limit will close the louvers completely and keep the electric lights turned off. Turning the knob clockwise will open the louvers wider, which can allow daylight levels to exceed the design. When the indicator on the adjustment knob is clockwise (to the right) of set, the electric light switch points are disconnected, preventing the electric lights from being turned on above the design light level.

The green LED indicates the louvers are fully open and the electric lights may be on, or be ready to automatically turn on, to maintain light levels. If photo-controlled switching is not desired the green LED indicates the electric lights may be manually turned on, if needed.

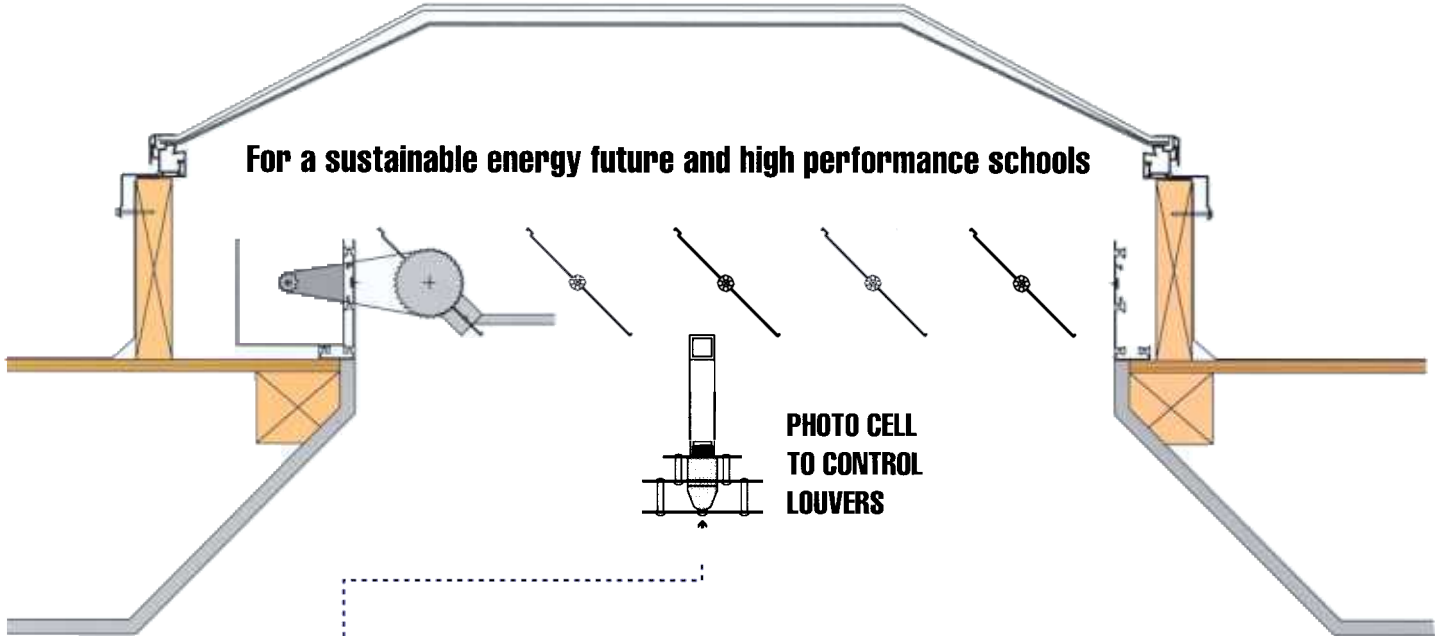
The red LED indicates the louvers are not fully open and the lights are turned off automatically, or should be manually turned off, if the automatic switching feature is not desired.

The override function causes the louvers to open fully and turns on the electric lights. To activate, push the override button quickly once for 30 minutes of override, twice for 60 minutes, and three times for 90 minutes. Four quick pushes will remove the override. Three small green LEDs indicates the time remaining on the override.

The LCM 1000 will always be in either the Summer or Winter mode. In the Summer mode the louvers will stay open at night, unless the adjustment knob is turned counter clockwise to the closed position. In the winter mode the louvers will automatically close when it gets dark outside. To change modes hold the override button down and after a short period, it will scroll from Summer to Winter to Summer. Release the button on the desired season.



**For a sustainable energy future and high performance schools**



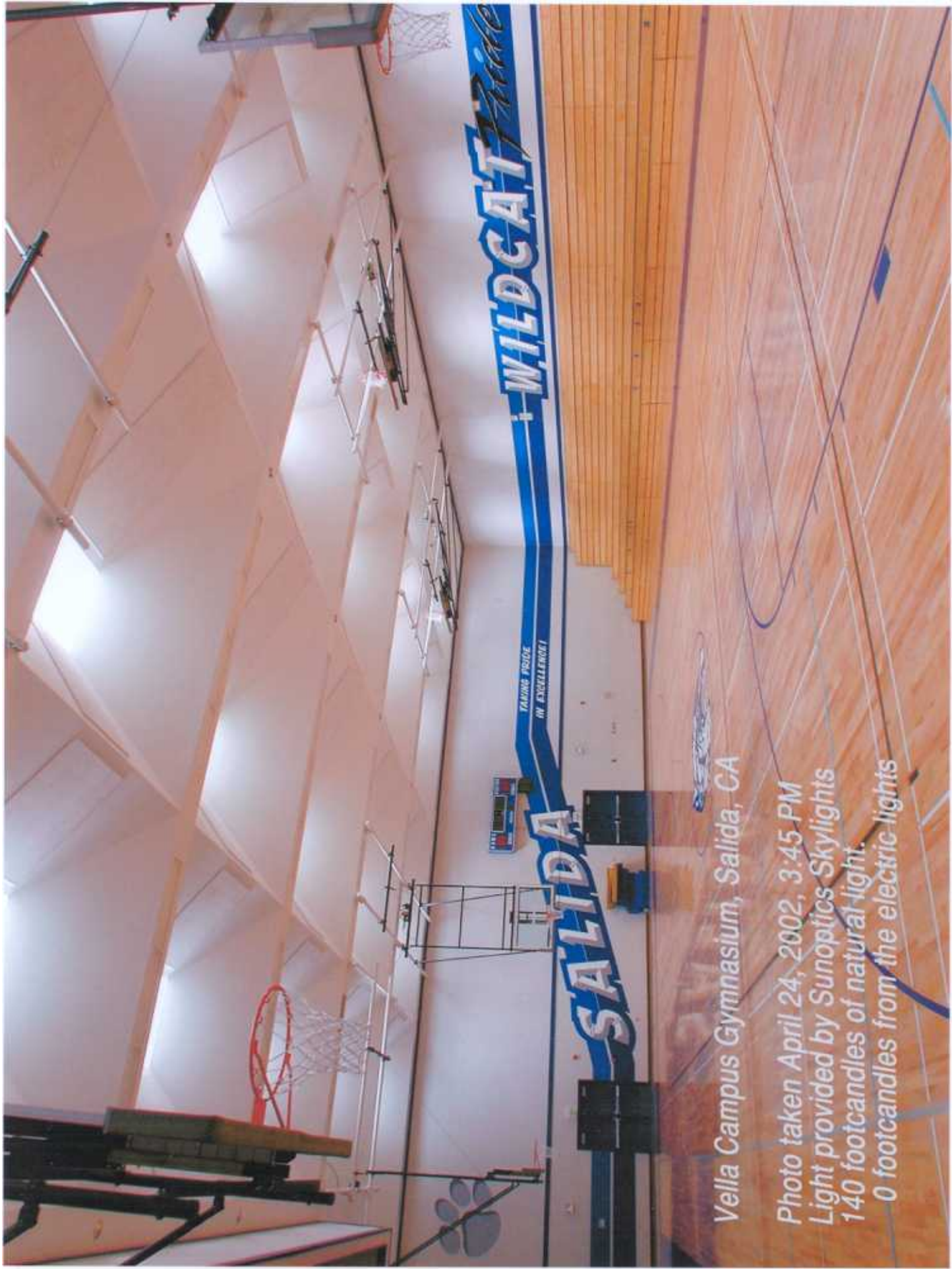
## LCM 1000 LIGHT & LOUVER CONTROLLER



**The LCM 1000 LIGHT AND LOUVER CONTROLLER provides the following features.**

1. Maximum energy savings while giving complete control to the teacher/user.
2. Photo control of the louvers maintains Daylight levels and is adjustable by the user.
3. Photo controlled switching at two light levels for two circuits of electric lights, or three levels, if three lamp fixtures are used.
4. A zero to 10 volt dimming signal when dimmable ballasts are used.
5. An adjustable timed override.
6. A summer or winter mode.

**Gives teachers full control of the classroom lighting**



Vella Campus Gymnasium, Salida, CA

Photo taken April 24, 2002, 3:45 PM

Light provided by Sunoptics Skylights  
140 footcandles of natural light.

0 footcandles from the electric lights



*CSAA Office Building  
Antioch, California  
PG&E act<sup>2</sup> Project*

*Architect:*

*Brian Congleton AIA  
Carmel, Ca.*

*Daylighting consultant:*

*Charles Eley Associates  
San Francisco, Ca.*

*Extensive daylighting replaces  
most artificial light. 29 skylights  
featuring triple glazed clear  
prismatic lenses and motorized  
light control louvers are tied to  
photo cell controlled switching.*

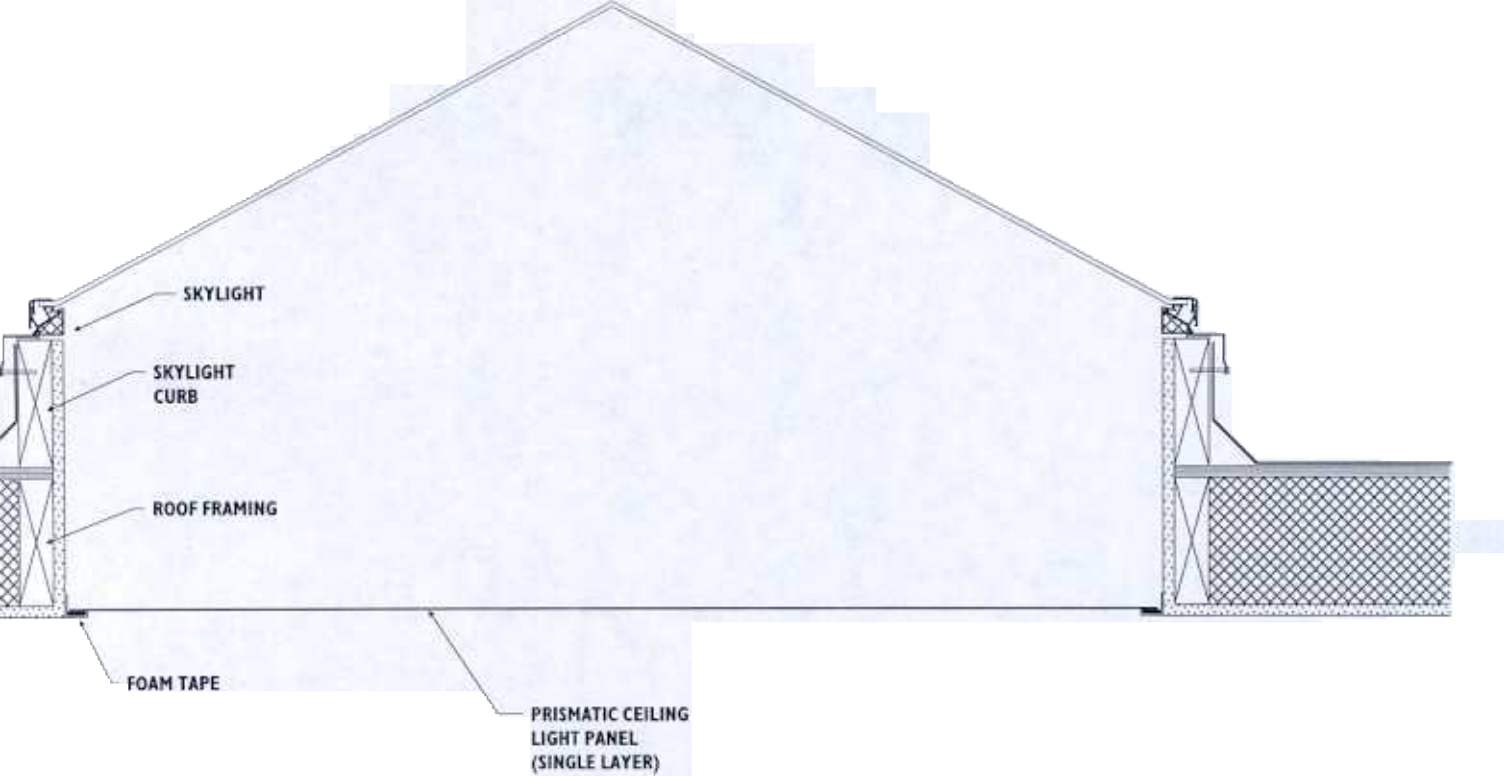


 **SUNOPTICS  
PRISMATIC  
SKYLIGHTS**  
**THE NATURAL LIGHT FIXTURE**

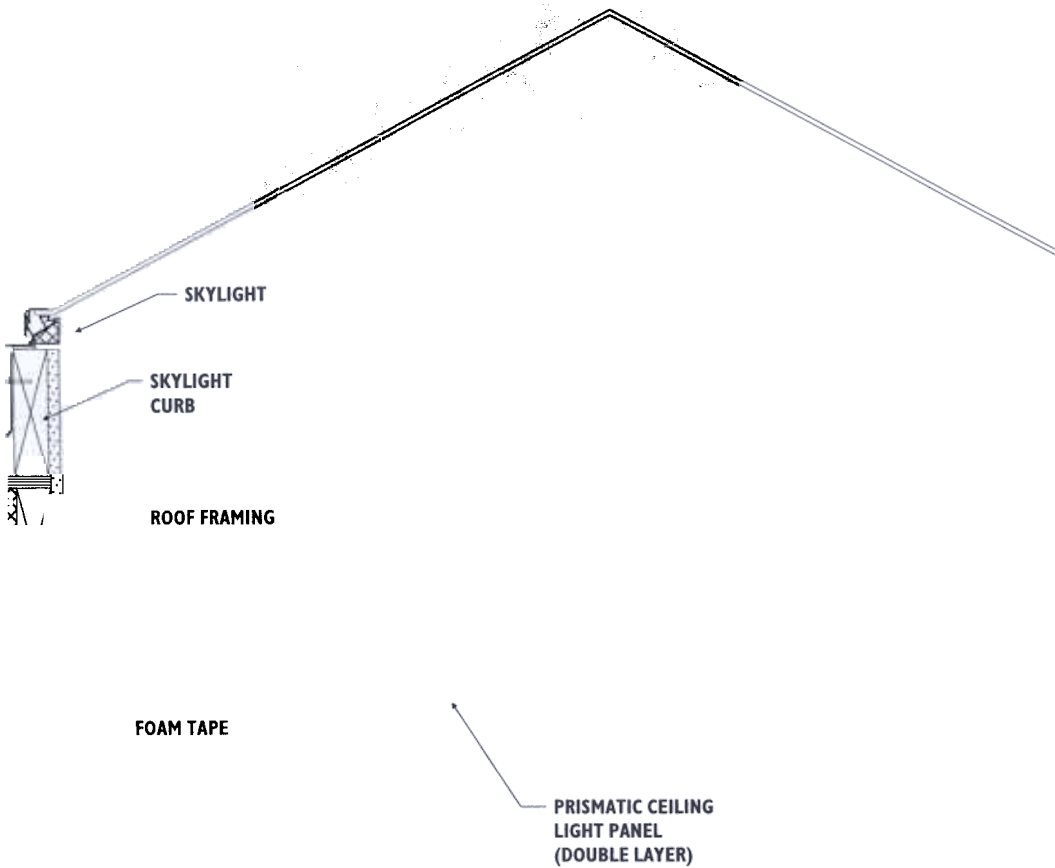
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Drawing title		
SKYLIGHT & DROP PANEL (SINGLE PANEL)		
Date	6/3/02	Sheet
	NONE	I



Drawing title		
SKYLIGHT & DROP PANEL (DOUBLE PANEL)		
Date	6/3/02	Sheet
Scale	NONE	I